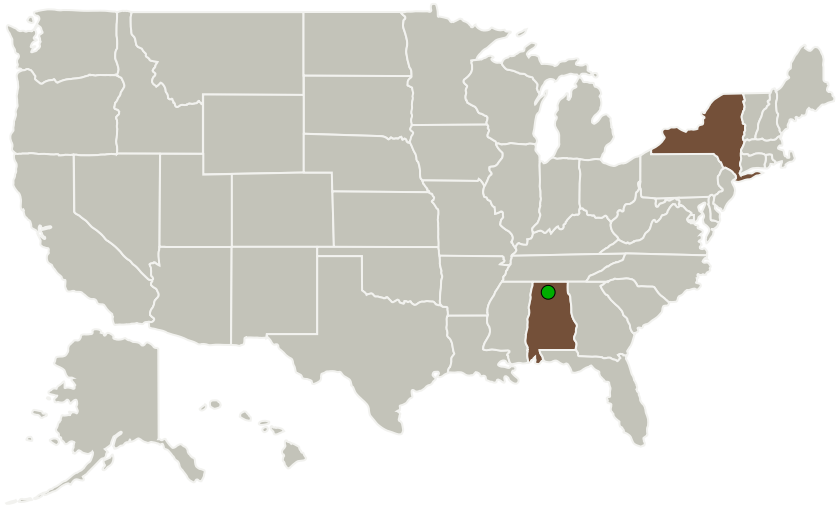
Pneumatic Proboscis Heat Flow Probe, Phase I

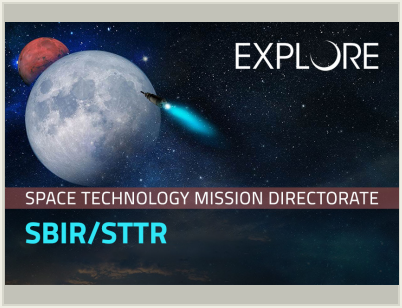
Completed Technology Project (2011 - 2011)

Project Introduction

The heat flow probe directly answers requirements in the topic: S1.11 Lunar Science Instruments and Technology: "Geophysical Measurements: Systems, subsystems, and components for heat flow sensors)" The primary objective of the Phase I/II is to develop TRL6, robust, low-power and low-mass instrument for geothermal heat flow measurement for small robotic lunar landers. A key challenge is to install thermal sensors to the depths > ~3 m, below the fluctuations of the surface thermal environment, with little thermal disturbance to the regolith. The proposed system is novel in two respects: 1) it utilizes a pneumatic (gas) approach, excavates a hole by lofting the lunar soil out of the hole, and 2) deploys the heat flow probe, which utilizes a coiled up tape with 10 equally spaced RTDs and a cone with thermal needle (for conductivity measurement) to reach >3 meter depth. The system is a game-changer for small lunar landers; it exhibits extremely low mass, volume, and simple deployment. The pneumatic system takes advantage of the Helium gas used for pressurizing lander propellant. In vacuum experiments we found that 1g of gas at 5 psia could loft ~6000g of lunar soil simulant at >10m/s.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Honeybee Robotics, Ltd.	Lead Organization	Industry	Pasadena, California
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	New York

Project Transitions

February 2011: Project Start

August 2011: Closed out

Closeout Summary: Pneumatic Proboscis Heat Flow Probe, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138412)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Honeybee Robotics, Ltd.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Kris Zacny

Co-Investigator:

Kris Zacny

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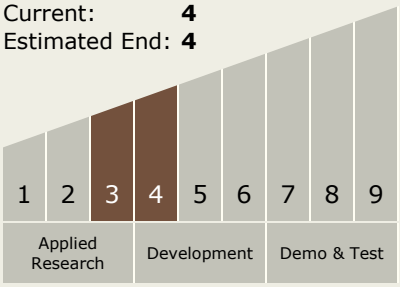
Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.2 Heat Transport

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System